# WATER QUALITY CRITERIA FOR MOLYBDENUM

MINISTRY OF ENVIRONMENT AND PARKS

PROVINCE OF BRITISH COLUMBIA

# WATER QUALITY CRITERIA FOR MOLYBDENUM

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Date

Signature
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## PREFACE

The Ministry of Environment and Parks is developing province-wide water quality criteria for variables that are important in the surface waters of British Columbia. This work has the following goals:

(i) to provide criteria for the evaluation of data on water, sediment, and biota for water quality assessments.
(ii) to provide criteria for the establishment of site-specific water quality objectives.

The water quality objectives for specific waterbodies will be based on the criteria as well as on present and future water uses, waste discharges, hydrology/oceanography, and water quality. The process for establishing water quality objectives is more fully outlined in "Principles for Preparing Water Quality Objectives in British Columbia", copies of which are available from the Water Management Branch.

The definition adopted for criterion is:

"A maximum and/or a minimum value for a physical, chemical or biological characteristic of water, sediment or biota, applicable province-wide, which must not be exceeded to prevent specified detrimental effects from occurring to a water use, including aquatic life, under specified environmental conditions".

The criteria are province-wide in application, but use-specific, and are being developed for the following water uses:

- Drinking, public water supply, and food processing*
- Aquatic life and wildlife
- Agriculture (livestock watering and irrigation)

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*For raw water sources prior to treatment (the responsibility for regulating the quality of domestic water as supplied by a water purveyor lies with the Ministry of Health).

- Recreation and aesthetics**
- Industrial (other than food processing)

Criteria from the literature and other jurisdictions are evaluated, and criteria are adopted or developed from this evaluation. Recognizing that criteria from the literature do not necessarily reflect adequately the effects of contaminants in all waterbodies, the criteria in this document should be interpreted as guidelines. Site-specific criteria may be developed in special cases where the province-wide criteria are judged to be inadequate.

If a waterbody has several water uses, then the criteria for the most sensitive water use will be considered for developing water quality objectives. For specific waterbodies, particular circumstances could lead to objectives which are either more or less stringent than the criteria.

The criteria will be subject to review and revision as new knowledge becomes available, or as other circumstances dictate.

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** The Ministry of Health has the responsibility for regulating the use of public bathing beaches with respect to the public health aspects.

## RECOMMENDED CRITERIA

These criteria for molybdenum are based on a detailed analysis given in a technical appendix.

### DRINKING WATER

(Includes Food Processing Water)

Raw Drinking Water With or
Without Treatment

Total molybdenum: 0.25 mg/L maximum

Advanced water treatment methods may remove molybdenum, and allowances could be made on a site-specific basis if information on treatment efficiency is available.

### AQUATIC LIFE

(i) Freshwater

Total molybdenum: ≤ 1 mg/L average for 30 days from a minimum of five weekly samples
2 mg/L maximum

(ii) Marine

There is not enough information available at this time to recommend marine criteria.

### WILDLIFE

Total molybdenum: 0.05 mg/L maximum

**LIVESTOCK WATERING**

(i) Where forage is not irrigated, or if no molybdenum-containing fertilizers are applied to grow feed consumed by livestock:

Total Molybdenum: 0.08 mg/L maximum

(ii) All other cases:

Total molybdenum: 0.05 mg/L maximum

**IRRIGATION WATERS**

Maximum and average values cited apply during the irrigation season, with average values being calculated from samples collected at a minimum of once per week for five weeks in a period no longer than thirty days.

(i) Poorly-drained soils used for forage crops, and Cu:Mo < 2:1 in irrigation water:

Total molybdenum: ≤0.01 mg/L average
0.05 mg/L maximum

(ii) Well-drained soils used for forage crops; or poorly-drained soils used for forage crops, but where Cu:Mo ratio ≥ 2:1 in irrigation water:

Total molybdenum: ≤0.02 mg/L average
0.05 mg/L maximum

(iii) All soils used for non-forage crops:

Total molybdenum: ≤0.03 mg/L average

**INDUSTRIAL WATER SUPPLIES**

No criterion is proposed.

## APPLICATION OF CRITERIA

Concentrations of molybdenum normally will be well below the proposed criteria in streams unaffected by anthropogenic activity. Therefore little concern usually will exist with respect to aquatic life, wildlife, irrigation, livestock, and human consumption of these waters.

Judgement will have to be used when applying these criteria for irrigation purposes. Ideally, an analysis of the irrigated land should be done to provide information on soil pH, copper, and molybdenum content, and to determine if the soil is well drained. When such information is not available, soil survey maps can be used. Three drainage classes from these maps would be associated with the class of well drained, in this document. These are rapidly, well, and moderately well drained. Corresponding to the class of poorly drained in this document are the map classifications of imperfectly, poorly, and very poorly drained.

Objectives which are established should consider the drainage of the soil, the type of crop, and whether high copper concentrations exist in the irrigation water which would offset deleterious effects of molybdenum.

## SUMMARY OF WATER QUALITY CRITERIA FOR MOLYBDENUM

| Characteristic / Water Use | Total Molybdenum (mg/L) | |
|---|---|---|
| | 30-day* Average | Maximum |
| Drinking Water | | |
| Raw untreated | None Proposed | 0.25 |
| Aquatic Life (freshwater) | ≤ 1 | 2 |
| Wildlife | None Proposed | 0.05 |
| Livestock Watering | | |
| For livestock consuming forages not irrigated or if no molybdenum-containing fertilizers are applied to grow feed consumed by livestock | None Proposed | 0.08 |
| All other cases | None Proposed | 0.05 |
| Irrigation Waters | | |
| Poorly drained - Cu:Mo<2:1 in irrigation water-forage crops | ≤ 0.01 | 0.05 |
| Poorly Drained - Cu:Mo>2:1 in irrigation water-forage crops | ≤ 0.02 | 0.05 |
| Well Drained - forage crops | ≤ 0.02 | 0.05 |
| All soils - Non-forage crops | ≤ 0.03 | None Proposed |

*Calculated from a minimum of five weekly samples collected in a period of thirty days.